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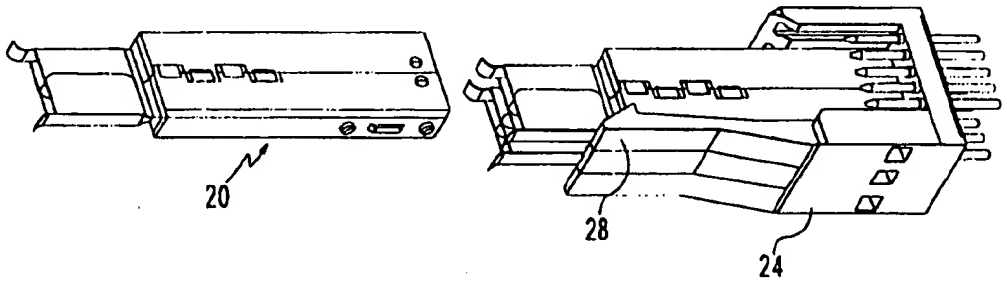

(57) Abstract

A shielded cable connector (20) which minimizes EMI and crosstalk between closely situated assembly modules is disclosed. The shielded cable connector comprises a connecting latch (28). The shielded cable connector facilitates insertion of the shielding housing (20) into a shielded header connector (24), and prevents inadvertent removal of the shielding housing (20) from the shielded header (24).

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Shielded Cable Connector

FIELD OF THE INVENTION

The present invention relates generally to cable connectors. In particular, the invention relates to a shielded cable connector for reducing electromagnetic interference (EMI) and crosstalk between and among closely situated cable connections.

BACKGROUND OF THE INVENTION

High density back panel connectors such as METRAL™ connectors, sold by Berg Electronics, are available in various standardized lengths. Such high density connectors have a standardized contact grid pitch of 2mm and standardized mating interface dimensions. Such connectors have been marketed widely by several companies and are widely known in the industry.

It is generally known in the art, that such connectors are modularized and can be combined and assembled to form connectors having a particular desirable length. Typically, this is accomplished by stacking standard length headers and receptacle connector modules. To form both sides of an electrical interconnection, for example, an assembly module, or cable terminator matching the desired length can be plugged into an assembly of stacked header connectors.

Although stacking such connectors is known in the art, problems remain with regard to combining connectors in this manner. Because the close proximity of the modules and the close spacing of contacts, these systems are susceptible to crosstalk. The connectors may encounter EMI from external sources as well as from each other. Also, inserting a mating module into a series or stack of header connectors is often difficult. Such modular arrangements have in the past provided insufficient guidance mechanisms so as to insure proper connection between mating arrays of modules. Further, assembly modules such as those forming

cable connectors often are inadvertently disconnected from the header connector. Thus, prior art connectors lack a reliable means for preventing movement of cable connectors once they are engaged with the composite header.

Therefore, there remains a need for a cable connector which minimizes EMI and crosstalk, provides sufficient guidance so as to easily attach an assembly module to a header connector, and provides a means of adequately securing an assembly module to a header connector.

SUMMARY OF THE INVENTION

The present invention, fulfills this need with a shielded high density cable interconnection system. The present inventive shielded interconnection system comprises an assembly module, a header connector adapted for accepting the assembly module, a shielding housing for enveloping the assembly module, and a latch member for securing the shielding housing and the assembly module to the header connector.

The shielded interconnection system comprises a shielded header having a first sidewall, a second sidewall, and a rear header wall having multiple terminals extending therefrom for receiving the assembly module. The first sidewall and the second sidewall have receiving slots for guiding the shielding housing into the shielded header connector. The first sidewall and second sidewall each further have grounding springs which contact dimple recesses located on the shielding housing when the shielding housing is inserted into the header connector. The second sidewall also has a recess located therein for accepting the latch member.

The shielding housing of the cable connector comprises a first half shell and a second half shell. The shielding housing further comprises a means for attaching the first half shell with the second half shell so as to

form a 360 degree shielding around the perimeter of said assembly module.

The latch member of the interconnection system comprises an elongated distal object having at least one first leg end for insertion into the shielded header connector, and a second spring arm end for latching onto the shielding housing. The latch member functions to immobilize the relative movement of the shielded header and the shielding housing and thereby prevent inadvertent disconnection of the cable connector from the shielded header connector.

Other features of the present invention are described below.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be better understood, and its numerous objects and advantages will become apparent by reference to the following detailed description of the invention when taken in conjunction with the following drawings, in which:

Figures 1A through 1D depict a prior art METRAL™ receptacle connector and header connector;

Figure 2 provides a perspective view of the basic component parts of the present invention;

Figure 3 provides a perspective view of a stacked header connector with various assembly modules;

Figure 4 provides a view of a partially exploded assembly module and shielding housing;

Figures 5A through 5F provide a detailed view of the latch and latch slot features of the shielding housing;

Figure 6 provides a cross-sectional view of the latch and latch slot features of the shielding housing;

Figure 7 provides a view of a flat stamp layout of one half shell of the shielding housing;

Figures 8A through 8D provide various views of one half shell of a shielding housing formed from the flat stamp layout shown in Figure 7;

Figure 9 provides a view of a partially exploded three assembly modules partially enveloped in the shielding housing of Figures 7 and 8;

Figures 10A through 10G provide various views of the inventive shielded header connector;

Figures 11A through 11G provide various views of the inventive connecting latch;

Figures 12A through 12D provide various views of a shielding housing and connecting latch assembled with a shielded header connector;

Figure 13A through 13C provide various views of a connecting latch connector integrated with a shielded header;

Figure 14 provides a view of the 5x2 assembly module of Figure 4 fully enveloped in a shielding housing;

Figure 15 provides a view of an exploded 5x6 assembly module and partially enveloped in the shielding housing of Figure 9;

Figure 15A provides a view of a 5x6 assembly module fully enveloped in the shielding housing as shown in Figure 9;

Figure 16 provides a view of three 5x2 assembly modules of the type shown in Figures 4 and 14 received in a header connector and secured by a latch mounted in a header connector wall;

Figure 17 provides a view of the three 5x2 assembly modules secured in header connector;

Figure 17A provides a view from a bottom perspective of the assembly module illustrated in Figure 17;

Figure 18 provides a view of a 5x6 assembly module partially inserted into a header connector;

Fig. 19 provides a view of the 5x6 assembly module of Figure 18 fully inserted into a header connector.

DETAILED DESCRIPTION OF THE INVENTION

Figures 1A through 1E depict a prior art receptacle connector and header connector such as the METRAL™ line of connectors sold by Berg Electronics. As shown in Figure 1A, a receptacle connector 2 includes a matrix of contact terminals 4 mounted within a housing area electrically connected to tails 6. The distance between the center of any two adjacent rows (e.g. row a and b) of terminals 4 is 2 mm. Similarly, the distance between the center of any two adjacent columns (e.g. 23 and 24) of terminals is 2 mm. Thus, the basic connection grid for a prior art METRAL™ receptacle is 2 x 2 mm. Prior art METRAL™ receptacle connectors 2 typically come in modules having six columns and are therefore 12 mm in length. Although the receptacle 2 shown in Figure 1A has four rows of terminals 4, it will be understood that the number of terminal 4 rows may vary. Generally, the basic receptacle connector module contains 5 rows and 6 columns and is referred to as a 5x6 receptacle module. The present invention is described below with reference to Figures 2 through 19, all of which assume a 5x6 receptacle connector. It should be noted that the receptacle connector 2 shown in Figure 1 is a portion of a composition of several receptacle connector modules which are shown stacked together, end to end.

Figure 1B provides a side view of a prior art METRAL™ receptacle connector 2. Prior art METRAL™ receptacle connector 2 is characterized by dual beam contact terminals attached to right angle bent tails 6, which are thru-mount or press-fit to a printed circuit board 8.

Figure 1C provides an elevated perspective view of a prior art METRAL™ receptacle connector 2. As shown in Figure 1C, a receptacle connector 2 has two raised rails 10 on one side with two polarizing latch ears 12 and fixing pegs 14 (Figure 1B) on the opposite side.

Figure 1D is a view of a prior art straight through header connector 16. In one contemplated form of the invention pins extending from the rear 17 of the header connector 16 are received by the terminals 4 of receptacle connectors 2, to convert the receptacles 2 for receipt of receptacle type cable connectors, later described. Similar to the receptacle connector 2, header connector modules typically are 5x6 in dimension so as to cooperate with the receptacle connectors 2 of similar dimension. Alternatively, a right angle pin header, preferably shielded, can be used in place of the combination of receptacle 2 and straight-through header 16.

Figure 2 provides a simplified perspective view of the present invention. As shown in Figure 2, a shielding housing 20 envelopes an assembly module 22 which is subsequently attached to a shielded or die cast header 24 to provide a modular shielded interconnection.

The shielding housing 20 is made from an alloy which is environmentally acceptable and which provides sufficient insulating qualities so as to prevent EMI and crosstalk. In the presently preferred embodiment, the shielding housing 20 is made from a beryllium copper alloy with a thickness of about 0.15 mm. Other suitable materials could alternatively used.

Also shown is a connecting latch 28. A connecting latch 28 attaches to the wall 30 of the shielded header 24 and latches onto the shielding housing 20. The connecting cable latch 28 operates to secure the shielding housing 20 and enveloped assembly module 22 to the shielded header 24.

Although not visible in Figure 2, the basic assembly module 22 may contain, for example, two rows of terminals with each row containing five terminals. Typically, the terminals include a front receptacle contact portion for mating with the pins of header 24 and rear portions to which individual wires from a cable are attached, for example, by an IDC termination. As suggested by the Figure, when an assembly module 22 is plugged into

the header connector 24, the assembly module attaches to the header so as to be ninety degrees rotated from the receptacle connector. Therefore the columns of assembly terminals 26 are connected indirectly through the header 24 to the rows of terminals in the receptacle connector 2. Similarly, the rows of terminals 26 in the assembly module 22 are indirectly connected to the columns of terminals 4 in the receptacle connector 2. In relation to the matrix terminals 4 of the receptacle connector 2, the assembly module 22 is said to be a 5x2 module, where 5 represents the number of rows in the receptacle connector 2 to which the assembly module 22 is connected and 2 represents the number of columns in the receptacle connector 2 to which the assembly module 22 is connected. As noted above, each terminal 4 column in the receptacle connector is 2 mm deep. Therefore, a 5x2 assembly module 22 such as that shown in Figure 2 which is connected to two columns of terminals on the receptacle connector 2, is 4 mm deep.

The shielded header connector 24 pictured in Figure 2 is a 5x6 module, i.e. it is connected to 5 rows and 6 columns of the receptacle connector 2. Therefore, there is room in the header connector 24 to receive three of the 5x2 assembly modules. Of course, assembly modules 20 of the present invention may vary in size.

Figure 3 provides a view of a side by side vertically stacked arrangement of shielded header connectors 26. As shown, shielding housings 20 of the present invention may come in other sizes such as 5x6 90 and 5x8 92. An assembly module may be enveloped individually in a shielding housings 20 or alternatively several assembly modules 20 may be enveloped together in single shielding housing 90, 92. Also shown in Figure 3, the connecting latch 28 component of the present invention can likewise vary to accommodate the various combinations of assembly modules, e.g. 5x6 connecting latch 94.

Figure 4 provides a partially exploded view of a 5x2 assembly module 22 enveloped in a shielding housing 20. As shown, the inventive assembly module 22 has three side studs 44 on each of its two side surfaces 40. Similarly, two studs 46 are located on each of the module's lateral surfaces 42.

The shielding housing 20 comprises two half shells 50. The half shells 50 have appropriately located side recesses 52, 54 and lateral recesses 55 which cooperate with the previously mentioned studs 44, 46 when the two shells 50 are fitted over the connector module 22. Thus, when the two half shells 50 are drawn together around the assembly module 22, the side studs 44 are received into the side recesses 52, 54. Likewise, the lateral studs 22 are received into the lateral recesses 55. The studs 44, 46 operate to insure that the assembly module 22 is properly seated in the shielding housing 20.

Also shown in Figure 4, the two half shells 50 of the shielding housing 20 comprise a series of latches 56 and latch slots 58. When the half shells 50 are placed together around the assembly module 22, the latches 56 insert into a corresponding slot 58 on the opposing half shell 50. The latch 56 and slot 58 combination along with the interconnection of the lateral studs 46 and lateral recesses 55 operate to secure the two half shells 50 around the assembly module 22.

Figure 14 provides a perspective view from an opposing angle of the two half shells 50 and the assembly module 22 of Figure 4 in a fully assembled position. As shown in Figure 14, the two half shells 50, by means of the studs (44, 46), recesses (52, 55, 54), latches 56, and latch slots 58, lock into each other to form a 360 degree shell over the periphery of the assembly module 22 as well as a substantial surface of the signal cable. As shown in Figure 14 and as was mentioned above, the assembly module 20 is a 5x2 module 22.

Figures 5A through 5C provide detailed frontal views of the latch 56 and slot 58 component of the shielding housing 20 in various stages of interconnection. Figures 5D through 5F provide corresponding rear views.

Figures 5A and 5D provide a view of the latch 56 and slot 58 when unconnected or in an "open" state. As shown, the latch 56 comprises a sheared cantilever beam 60 located on a tab 62. The tab 62 has been displaced over a small bend 64 with respect to the plane of shielding housing 20. Although the cantilever beam 60 is shown to be sheared from the tab, it should be noted that the cantilever beam instead of being sheared from the tab could alternatively be a detent or bump and the beam would function properly to secure the latch into the latch slot.

Also shown in Figures 5A and 5D, the receiving slot 58 is formed between a flat lug 66 and the plane of the shielding housing which is represented by dotted line 68. The flat lug 66 is connected to the shielding housing 20 by two bent members 70. A flat bias 72 extends from the flat lug 66.

Figures 5B and 5E provide a view of the latch 56 partially engaged with the latch slot 58. As shown, during the initial engagement, the tab 62 located on the latch 56 side contacts the flat bias 72 located on the corresponding latch slot 58 side. Provided the two are on the same plane, the latch 56 is easily inserted into latch slot 58.

Figures 5C and 5F provide a view of the latch 56 and latch slot 58 in the fully engaged or "home" position. As shown, the latch tab 62 engages behind the flat lug 66 edge and thereby secures the latch 56 in the latch slot 58.

Figures 6A through 6C provide a cross-section view of the latch 56 and latch slot 58 in the three stages of engagement described above, i.e. open, engaged, and home. Figure 6A provides a view of the latch 56 and latch slot 58 in an open state. Figure 6B provides a view of the latch 56 and latch slot 58 in a partially engaged state. Figure 6C

provides a view of the latch 56 and latch slot 58 in the home position.

Figure 7 provides a flat stamp layout view of a half shell 50 of the shielding housing 20. The flat stamp layout can be folded along lines A and B so as to form a half shell 50 into which three assembly modules may be enveloped.

As shown in Figure 7, circular side recesses 52 and lateral recesses 55 are located at one end of the stamped shield half shell 50. Located linearly away from each of the circular side recesses 52 is a somewhat larger diameter recess 52'. In the area of the half shell between each pair of recesses is located, but not shown, a raised dimple recess 54 which, as will be discussed below, comes into contact with a grounding spring located in a header connector. It should be noted that the half shell 50 depicted in Figure 7 has three pairs of circular recesses each of which is meant to engage the lugs of an assembly module. Along each side of the half shell 50 are located alternatively tabs 100 and flat biases 102. The tabs 100 are located opposite the flat biases 102 which appear at the same level on the opposing side of the half shell 50. Thus, when the half shell 50 is folded and placed around an assembly module 22, the tabs 100 and flat biases 102 are located opposite one another. It should be noted that the tab 100 and flat bias 102 of Figure 7 are machined into the latch 56 and latch slot 58 described above in connection with Figure 4.

At the furthest end of the half shell 50 are located two lobes 108. At that same end of the half shell 50 is located a central neck 110 with an adjoining flap 112. The central neck 110 and adjoining flap 112 encircle the cable when the half shell 50 is formed and placed around the assembly module 22.

Figures 8A through 8D provide various views of a half shell 50 formed by folding the stamped half shell 50 of Figure 7 along lines A and B. Figure 8A provides a view of

the portion of the half shell folded up from line A. Figure 8C provides a view of the portion of the half shell 50 folded up from line B. Figure 8B provides a view of the interior of a side of the half shell 50. As shown in Figure 8B, the half shell 50 has three combinations (52 and 54) of recesses, each of which is meant to engage with the studs of an assembly module. Figure 8D provides a view of the exterior of the half shell 50 from a perspective opposite that of Figure 8B.

Figure 9 provides a partially exploded view of a shielding housing 20 composed of half shells 50 formed around three assembly modules 22. The lateral stud 46 cooperates with the lateral recess 55 so as to secure the half shells 50 to the assembly modules 22. The side studs 44 on each module cooperate with the side recesses 52', 54 so as to insure that each module is properly seated in the housing 20.

The raised dimple recess 54 and the studs 44 protruding through the side recesses 52 also function to guide the shielding housing 20 into a header connector 24. As explained below in connection with Figure 10, when the shielding housing 20 is placed into a header connector, the protruding side studs 44 and the dimple recess 54 cooperate with slots located in the header connector walls thereby providing a guide for easy insertion of the shielding housing 20 into the header connector.

Figure 15A provides a perspective view of the three assembly modules fully enveloped within the assembly module of Figure 9.

Figures 10A through 10G provide various views of the inventive shielded header connector 24. The header connector depicted is a 5x6 module. Figure 10A provides a view of the interior of a side wall of the header connector 24. As shown, the header connector 24 has three slots 130 on the interior side wall. In the present invention, such slots 130 appear on the two side walls 134. These slots 130 accept the raised dimple recesses 54 and protruding side

studs 44 located on the exterior of a shielding housing 22. The dimple recess 54 and studs 44 are received into the slots 130 and thereby guide the shielding housing 20 and the assembly modules located therein, into the correct location within the header connector 24.

Figure 10C provides a sectional view of the header connector 24. As shown, one side wall 134 of the header connector contains a recess 132. This recess 132 is designed to accept the leg portion 140 of the connecting latch 28. Figure 10G shows a sectional view of this side wall. As shown, the recess can accept three separate leg portions 140 of a connecting latch 28. These legs may be either part of a single latch or multiple latches.

Figure 10D provides a end sectional view of the header connector 24 from the perspective of one looking into the base terminal wall of the header connector 24. As shown, the base wall 136 has multiple terminals extending therefrom. The header module shown in Figure 10D is a standard type and therefore the terminals are in a 5x6 arrangement. Along the sides of the terminal walls are located a series of ground springs 150. A ground spring 150 is located on each side wall aligned between each row of terminals on the base wall. When a shielding housing 20 is inserted into a header connector 24, the dimple recesses 54 on the exterior of the housing come into contact with the ground springs 150 and thereby provide grounding to the shielding housing.

As noted above in the discussion of Figure 10A, the present inventive header connector 24 contains three slots 130 on two opposite header walls 134. These slots accept the dimple recesses 54 located on the exterior walls of the shielding housings 20 which are placed into the header 24. In contrast, in prior art headers two dimple ribs were located on a single header wall opposite a single slot located on the opposite header wall. The increase in the number of slots in the header walls of the present invention allows for more ground contact springs on the

header walls which results in better force balance and multi-point grounding. Furthermore, the use of multiple slots on two header walls provides superior guidance when the shielding housing is inserted into the header. It is also within the scope of the present invention, to form the header walls so that dimples are present on one wall and slots are present on the other wall. In this embodiment the surface of the shielding housing would also have dimples on one exterior surface and slots formed on the opposite surface. This has the effect of polarizing the connection between the header connector and the shielding housing.

Figures 11A through 11G provide various perspective views of connecting latch 28. The connecting latch 28 shown is one typically used with a 5x2 assembly module. As shown, such a latch 28 has a leg 140 which enters the recess 132 located in the header wall previously shown in Figure 10. At the opposite extremity of the latch 28 is located a spring clamp 142 or shoulder which is used to fix the shielding housing 20 to the header connector 24.

Figures 12A through 12D provide various perspective views, partially in section of the header connector 24 in various stages of cooperation with the latch 28 and connector receptacle 20. As shown in Figure 12C, the latch 28 secures the shielding housing 20 to the header connector 24. The leg 140 portion of the latch 28 is inserted into the header wall recess 132. The spring clamp 142 portion of the latch 28 is secured to the shielding housing 20. The latch 28 thereby operates to secure the shielding housing 20 and the assembly modules 22 located therein to the header connector 24. It is also within the scope of the present invention to integrally form latch 28 and header connector 24.

Figure 12D provides a side view of the shielding housing 20. As shown, the dimple recesses 54 extend from the wall of the shielding housing 20. Referring to Figure 12C, when the shielding housing 20 is inserted into the header connector 24, each dimple 54 contacts a ground spring

150 located on the interior wall of the header connector 24. The contact between the dimples 54 and the ground springs 150 completes the grounding loop between the shielding housing 20 and the header connector 24. Local areas of the dimple recesses 54 may be gold plated so as to minimize impedance.

Figure 12B provides a side lengthwise view of the latch 28 and header connector 24 combination shown in Figure 12C. As shown in Figure 12B, two header connector modules 160 are shown stacked together. A first header connector module 160 has three 5x2 latches 28 inserted thereto. The sectional view of the header connector shows the leg 140 portion of each of the three latches 28 located in the header wall latch slot 132. A second header connector module 160 has a single 5x6 latch 94 inserted therein. The three legs 140 of the single 5x6 latch 94 can be seen in the sectional depiction of the header module 160.

Figure 12A provides a lengthwise view of the base wall of the header connector modules 160 shown in Figure 12B. As shown, each 5x2 module has a header wall ground spring 150 associated with it. By providing a ground spring 150 for each 5x2 module, the present invention insures sufficient grounding for each assembly module.

The present inventive shielded connector maintains the modular characteristics of prior art METRAL™ connectors. As discussed above, Figure 11 depicts a single latch 28 with a single latch spring clamp 142. Figure 12B illustrates that a header module 160 might have three individual 5x2 latch modules 28 attached or alternatively have one 5x6 module 94. As shown in Figure 13B a latch may also overlap header modules.

Referring to Figure 13B, the header module 160 shown to the furthest right in the Figure has three 5x2 latches 38 inserted thereto. The middle header module 160 has a single 5x2 latch 28 along with a portion of a 5x6 latch 94 inserted thereto. The 5x6 latch 94 overlaps between the module 160 shown in the middle and the module

160 shown to the furthest left. The single integrated 5x6 latch 94 can be used with its three legs 140 inserted into one header module, or two legs in a first module and the third leg in the adjacent header module. The inventive header connector 24 has been designed to allow for such overlap and modular use of components. The ability to overlap latches between modules has the added benefit of aligning adjacent modules 160 so as to maintain unity and end-to-end stackability of the total connector module.

The modularity of the present invention is not limited to the latches but extends to assembly modules as well. Figures 16, 17, and 17A provide various perspective views of three 5x2 assembly modules in various stages of connection with a header connector 24. As noted above the standard header connector module 24 pictured has a 5x6 dimension. Thus, the header module 24 can accept three 5x2 assembly modules.

Figures 18 and 19 provide a similar view of a single 5x6 assembly module inserted in various stages of engagement with a standard sized 5x6 header module. In contrast with the 5x2 modules illustrated in Figures 16 and 17, the single 5x6 assembly module fills the 5x6 header. Thus, a header module of the present invention may receive assembly modules of varying sizes.

The invention as set forth above is likewise described in U.S. Provisional Patent Application No. 60/019168, filed June 5, 1996 and titled "Shielded Cable Connector", which is hereby incorporated by reference.

The present invention may be employed in other specific forms without departing from the spirit or essential attributes thereof. For example, any number of materials may be used in manufacturing the shielding housing. Likewise different means for securing the shielding housing to the assembly modules might be used. While the invention has been described and illustrated with reference to specific embodiments, those skilled in the art will recognize that modification and variations may be made

without departing from the principles of the invention as described hereinabove and set forth in the following claims.

CLAIMS

What is claimed is:

1. A shielded cable interconnection for reducing EMI and crosstalk comprising:

an assembly module adapted to be attached to a cable;

a header connector adapted for accepting said assembly module;

a shielding housing for enveloping said assembly module; and

a latch member for securing said shielding housing and said assembly module to said header connector.

2. The shielded cable interconnection of claim 1, wherein said header connector includes a side wall and said latch member is mounted on said side wall.

3. The shielded cable interconnection of claim 1, wherein said latch member comprises a leg end and a spring end.

4. The shielded cable interconnection as recited in claim 1, wherein said header connector comprises:

a first sidewall;

a second sidewall;

a rear header wall having multiple terminals extending therefrom for receiving said assembly module;

wherein said first sidewall and said second sidewall have at least three receiving slots for guiding said shielding housing into said shielded header connector;

said first sidewall and said second sidewall each further comprising at least two grounding springs;

said second header sidewall having a recess located therein for accepting said latch member.

5. The shielded cable interconnection as recited in claim 1 wherein said shielded header connector comprises:

a means for guiding said assembly module into said shielded header connector;

a means for grounding said shielding housing when inserted into said header connector;

a means for accepting said connecting latch for holding said shielding housing to said shielded header connector.

6. The shielded cable interconnection as recited in claim 5, wherein said shielding housing comprises two opposite exterior surfaces having at least one dimple recess formed on each of said opposite exterior surfaces, wherein said means for guiding said assembly module into said shielded header connector comprises:

receiving slots located in a first sidewall and a second sidewall, said slots accepting said at least one dimple recesses when the shielding housing is inserted into said shielded header connector.

7. The shielded cable interconnection as recited in claim 5, wherein said shielding housing comprises two opposite exterior surfaces having at least one dimple recess formed on each of said opposite exterior surfaces, wherein said means for grounding said assembly module into said shielded header connector comprises:

at least two grounding springs connected to a first sidewall and a second sidewall, said at least two grounding springs contacting said at least one dimple recess when said assembly module is inserted into said header connector.

8. The shielded cable interconnection as recited in claim 5 wherein said means for accepting said connecting latch for holding said shielding housing to said header connector comprises:

a receptacle located in a sidewall whereby one end of said latch connector is inserted into said receptacle and

a second end of said connecting latch is attached to said shielding housing.

9. The shielded cable interconnection as recited in claim 1 wherein said header connector is electrically shielded.

10. The shielded cable interconnection as recited in claim 1 wherein said shielding housing is formed from electrically conductive material.

11. The shielded cable interconnection as recited in claim 10 wherein said shielding housing is formed from metal.

12. The shielded cable interconnection as recited in claim 1 wherein said shielding housing comprises:

a first half shell for enveloping a portion of said assembly module;

a second half shell for enveloping another portion of said assembly module; and

means for attaching said first half shell with said second half shell so as to form shielding around the perimeter of said assembly module.

13. The shielded cable interconnection as recited in claim 12 wherein said means for attaching said first half shell with said second half shell comprises:

at least one latch extending from either said first half shell or said second half shell, wherein said latch comprises a detent member located on a tab; and

at least one relief slot located in either said first half shell or said second half shell for accepting said at least one latch.

14. The shielded cable interconnection as recited in claim 13, wherein said relief slot comprises a flat lug displaced from a surface of said shielding housing.

15. The shielded cable interconnection as recited in claim 13, said assembly module having at least one stud extended from a side surface, said first half shell and said second half shell comprising:

at least one side recess through which said at least one stud extends from a side surface of said assembly module so as to insure that said assembly module is properly located within said first half shell and said second half shell.

16. The shielded cable interconnection as recited in claim 12, said shielded header connector having at least one slot located in a first sidewall and a second sidewall, said shielded header connector further having at least one grounding spring located on said first sidewall and said second sidewall, said assembly module having a stud extending from a lateral surface, wherein said first half shell and said second half shell comprise:

at least one raised dimple recess located on an opposing exterior wall of said first half shell and said second half shell, where said at least one raised dimple recess cooperates with said at least one slot in said header connector when inserted into said header connector so as to facilitate entry of said shielding housing into said shielded header connector, and where said at least one raised dimple recess contacts said at least one grounding spring located on said first sidewall and said second sidewall so as to provide adequate grounding to said shielding housing;

at least one lateral recess located on a lateral surface of said first half shell and said second half shell, where said at least one lateral recess receives said lateral stud extending from said assembly module so as to secure

said first half shell and said second half shell around said assembly module.

17. The shielded cable interconnection as recited in claim 1 wherein said latch member comprises:

an elongated distal object having at least one first leg end for insertion into said header connector, and a second spring arm end located remotely away from said first end for connecting to said housing, so as to immobilize the relative movement of said shielded header and said housing and prevent inadvertent disconnection of said shielding housing from said header connector.

18. A shielded cable connector comprising:

an assembly module having an insulative body and a row of contact terminals received on the body, the contact terminals being adapted to mate with an intermating contact terminal and receive a wire from a cable, and

a shielding housing comprising:

a first half shell for enveloping a portion of said assembly module;

a second half shell for enveloping another portion of said assembly module; and

means for attaching said first half shell with said second half shell so as to form shielding around the perimeter of said assembly module.

19. The shielded cable connector as recited in claim 18, wherein said means for attaching said first half shell with said second half comprises:

at least one latch extending from either said first half shell or said second half shell, wherein said latch comprises a detent member located on a tab; and

at least one relief slot located in either said first half shell or said second half shell for accepting said at least one latch.

20. The shielded cable connector as recited in claim 19, wherein said relief slot comprises a flat lug displaced from a surface of said shielding housing.

21. The shielded cable connector as recited in claim 20, said assembly module having at least one stud extended from a side surface, said first half shell and said second half shell comprising:

at least one side recess through which said at least one stud extends from a side surface of said assembly module so as to insure that said assembly module is properly located within said first half shell and said second half shell.

22. An electrical connector comprising a header wall having a plurality of terminals extending therefrom;

a first side wall extending from the header wall in generally the same direction as the terminals;

a second side wall extending from the header wall in generally the same direction as the terminals; and

a latch member mounted on and extending from the first wall.

23. A connector as in claim 22, wherein the first wall has a front edge and the latch member extends from the front edge.

24. A connector as in claim 23, wherein said front edge includes a recess and the latch member includes a leg received in the recess, the latch member further including a spring arm having a latch for engaging a mating connector.

25. A connector as in claim 24, wherein the front edge includes a plurality of recesses.

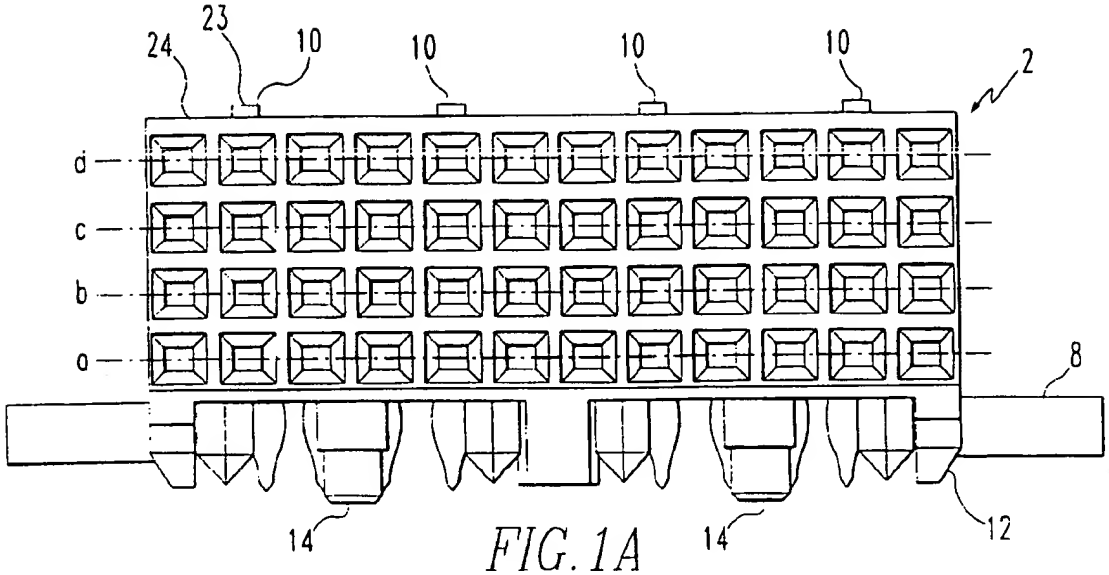


FIG. 1A
PRIOR ART

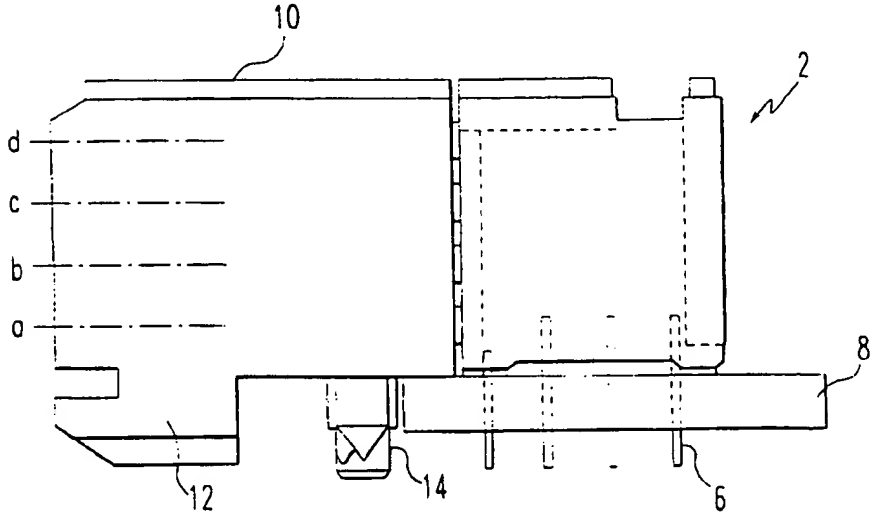


FIG. 1B
PRIOR ART

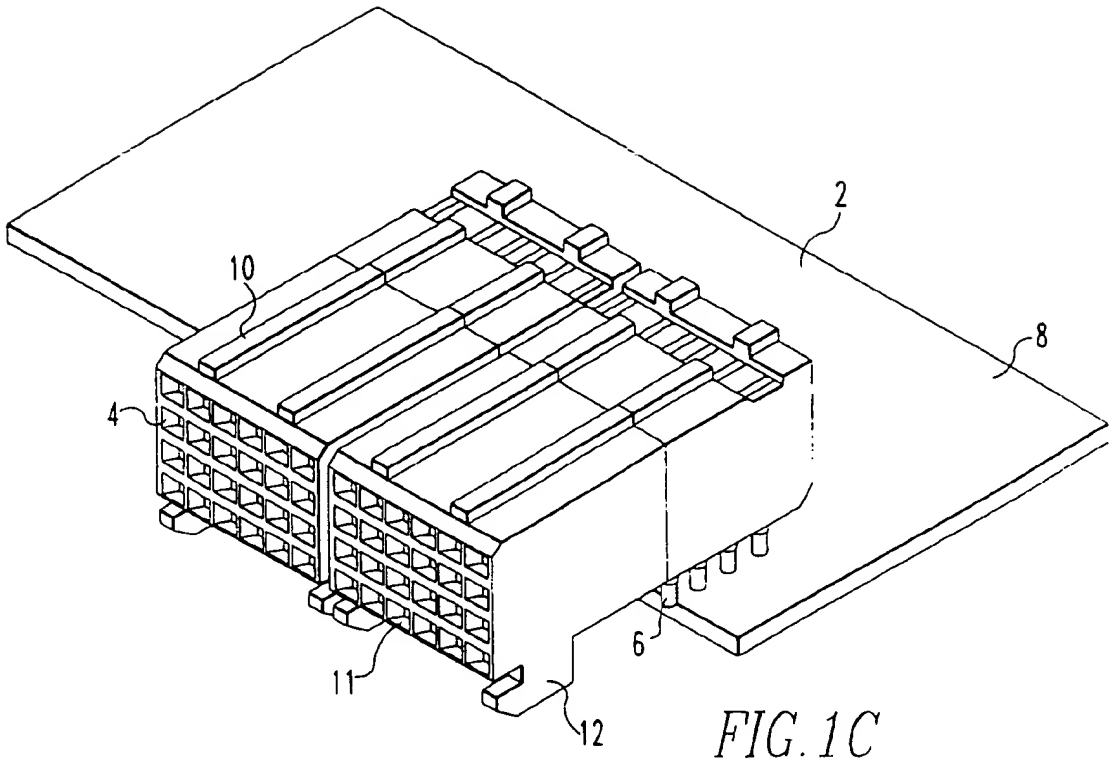


FIG. 1C
PRIOR ART

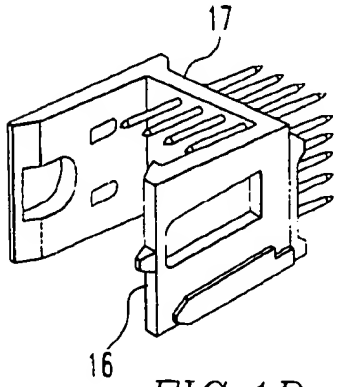


FIG. 1D
PRIOR ART

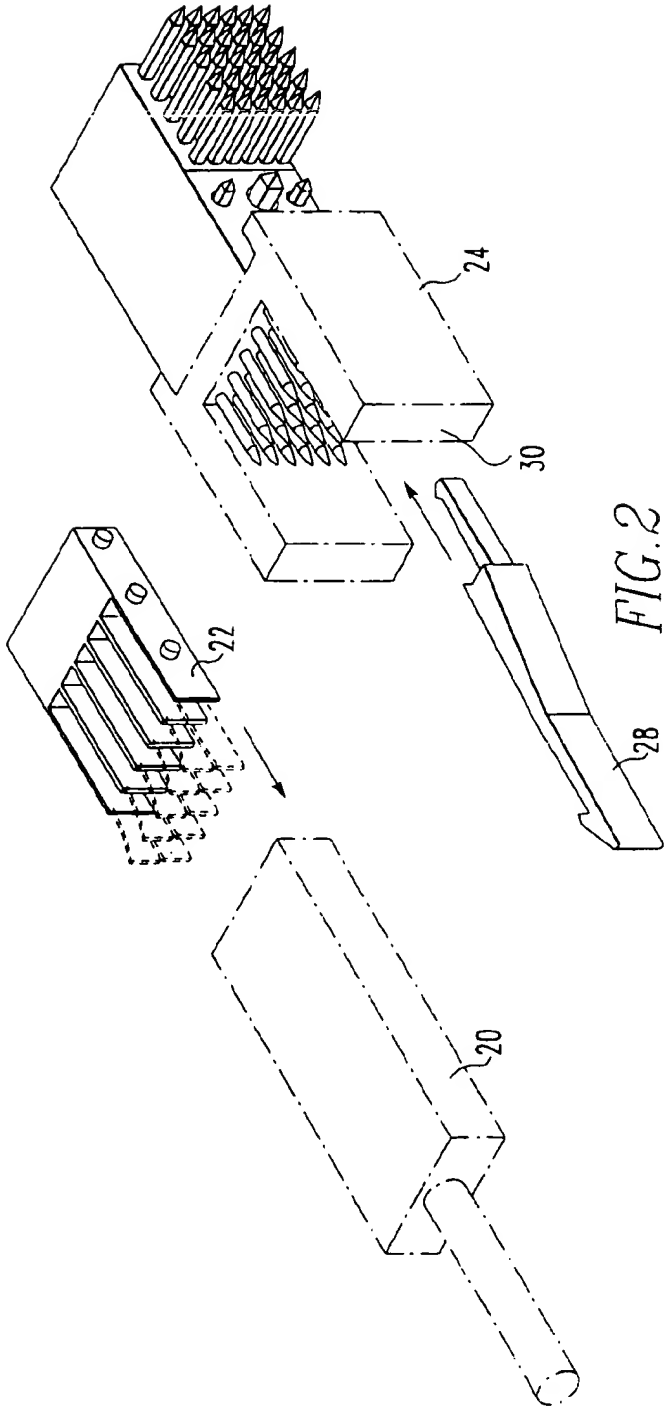


FIG.2

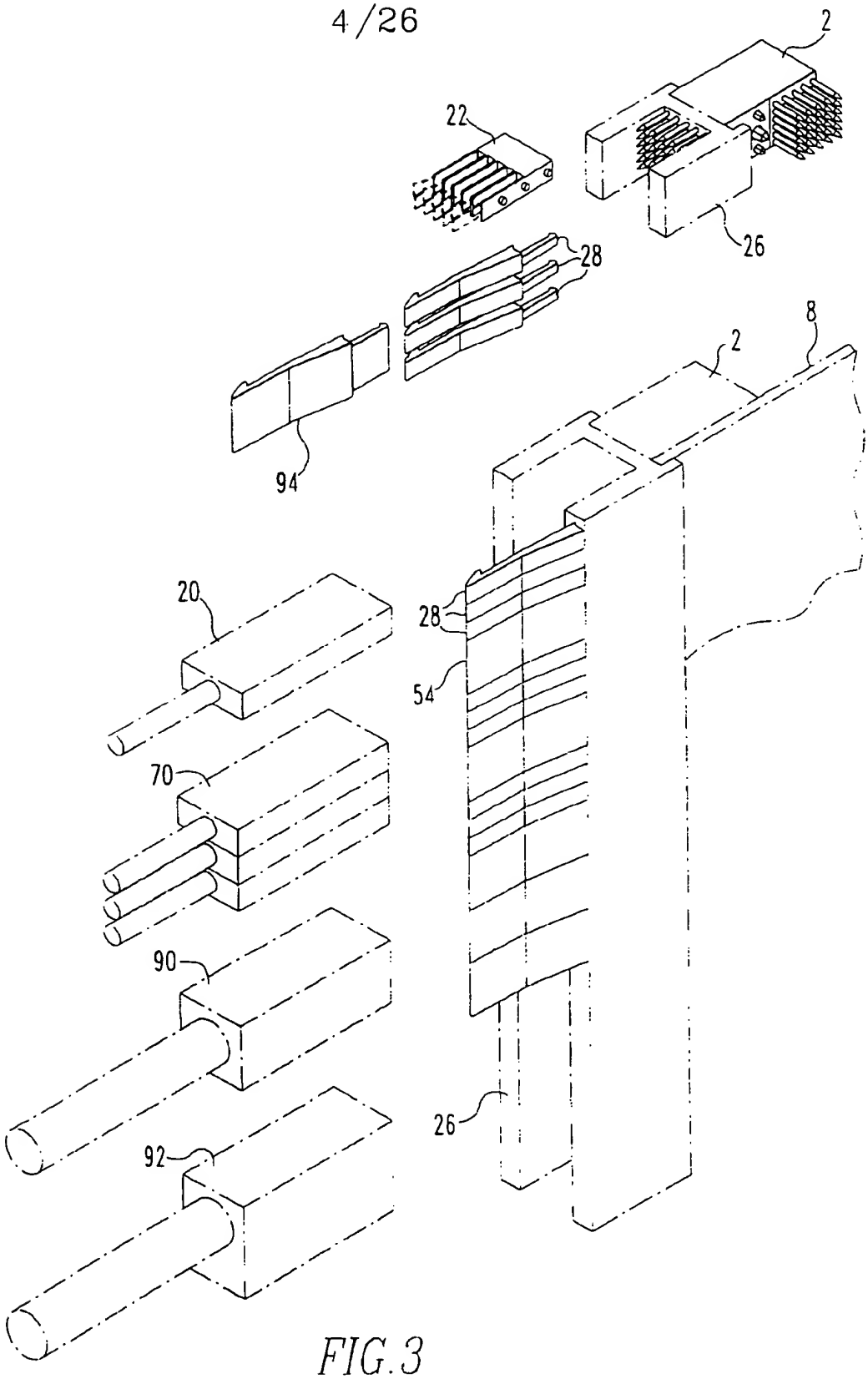


FIG.3

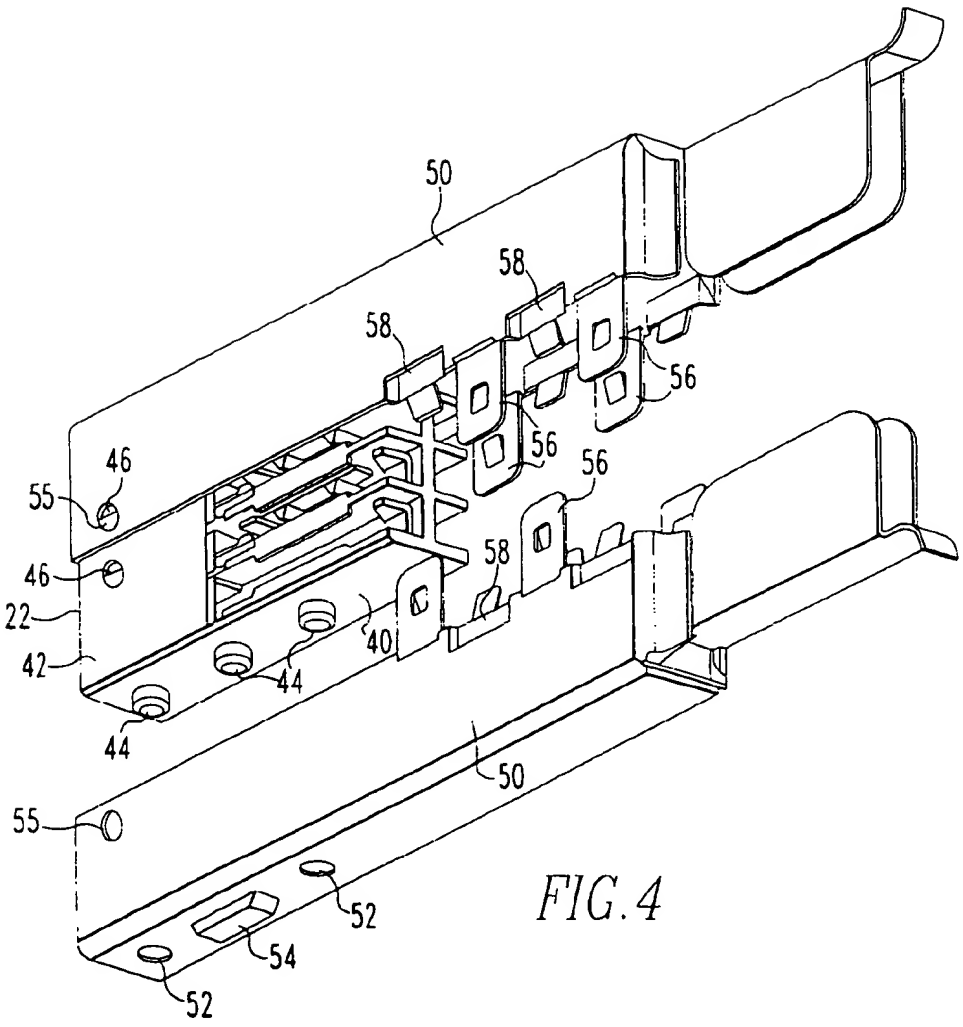


FIG. 4

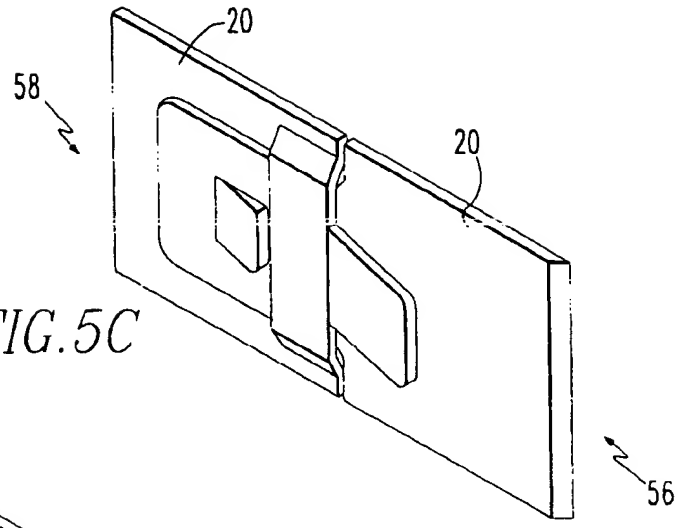


FIG.5C

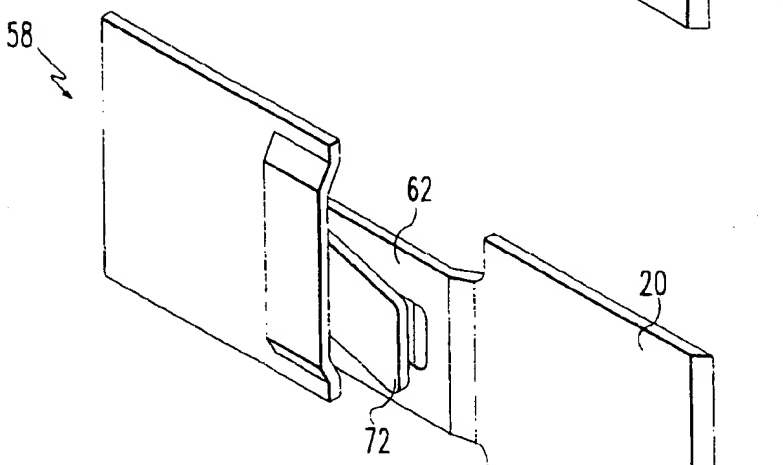


FIG.5B

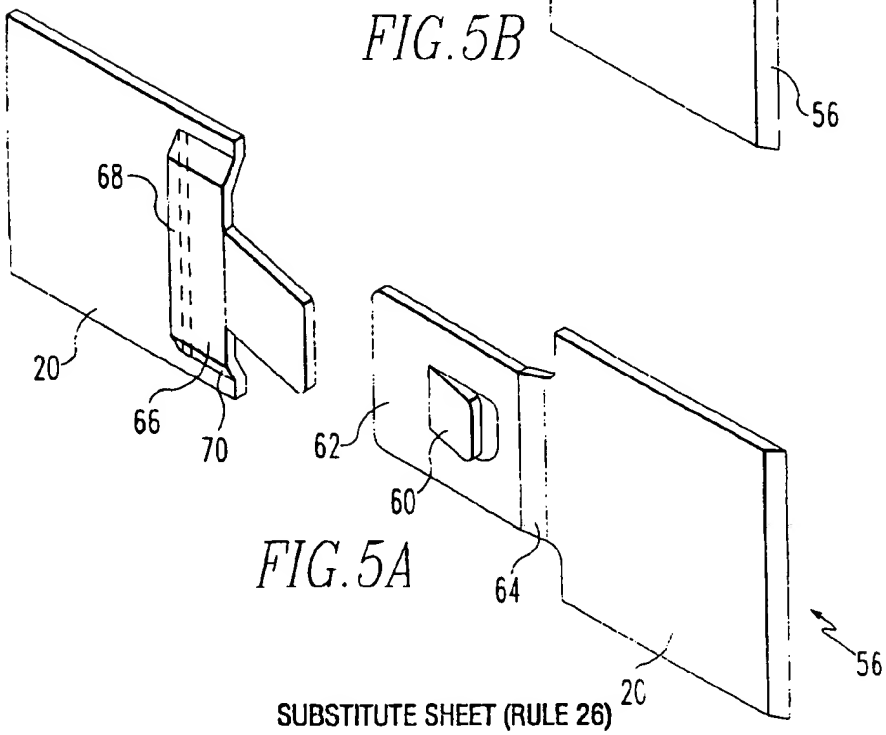


FIG.5A

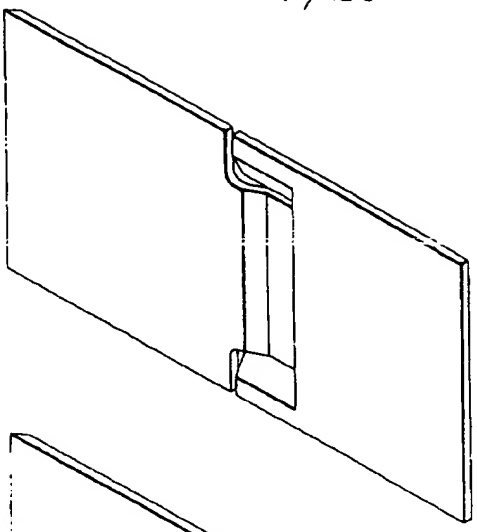


FIG.5F

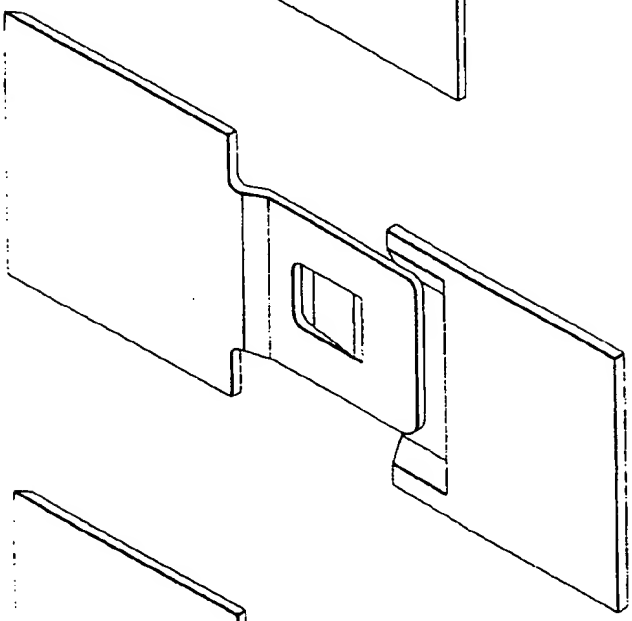


FIG.5E

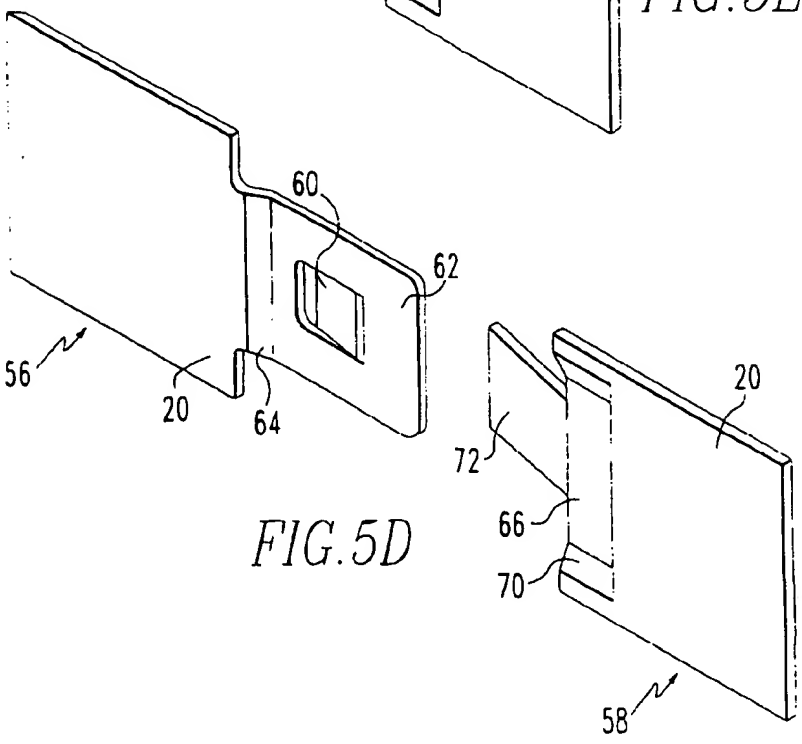


FIG.5D

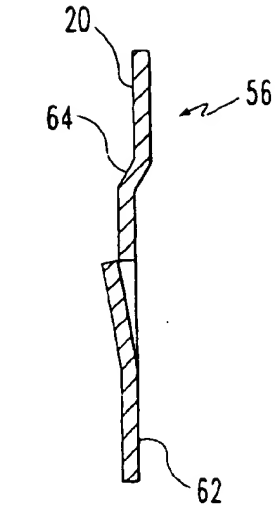


FIG. 6A

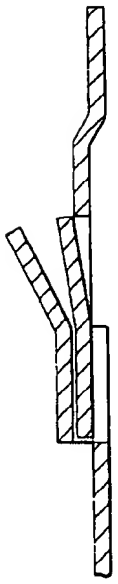


FIG. 6B

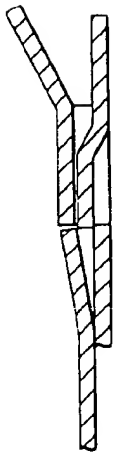
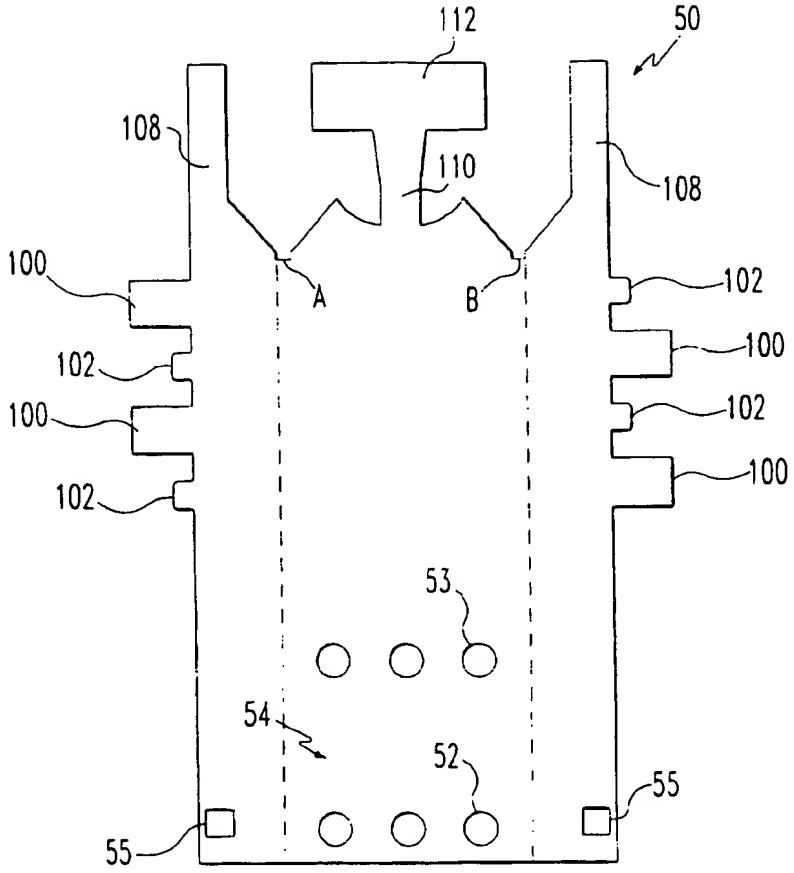


FIG. 6C


112
50
108
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108
100
A
B
102
102
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102
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55

FIG. 7

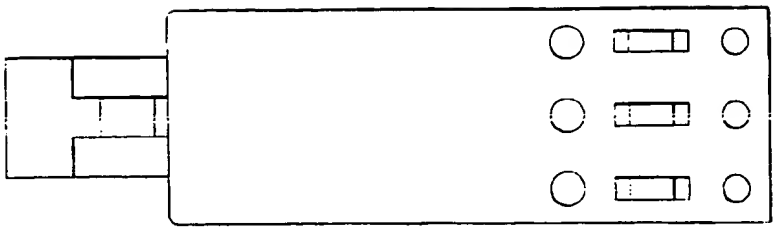


FIG.8D

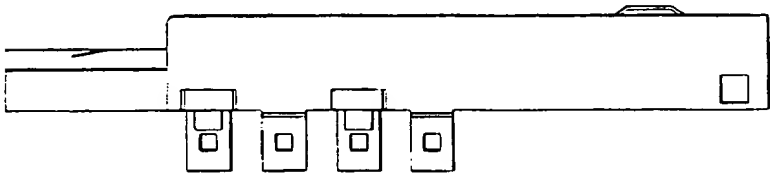


FIG.8C

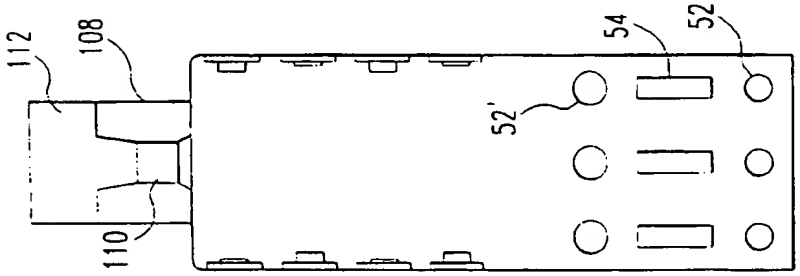


FIG.8B

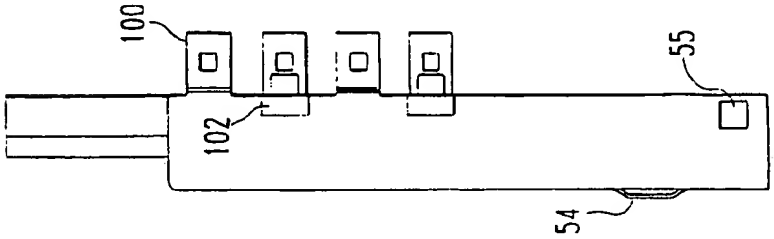


FIG.8A

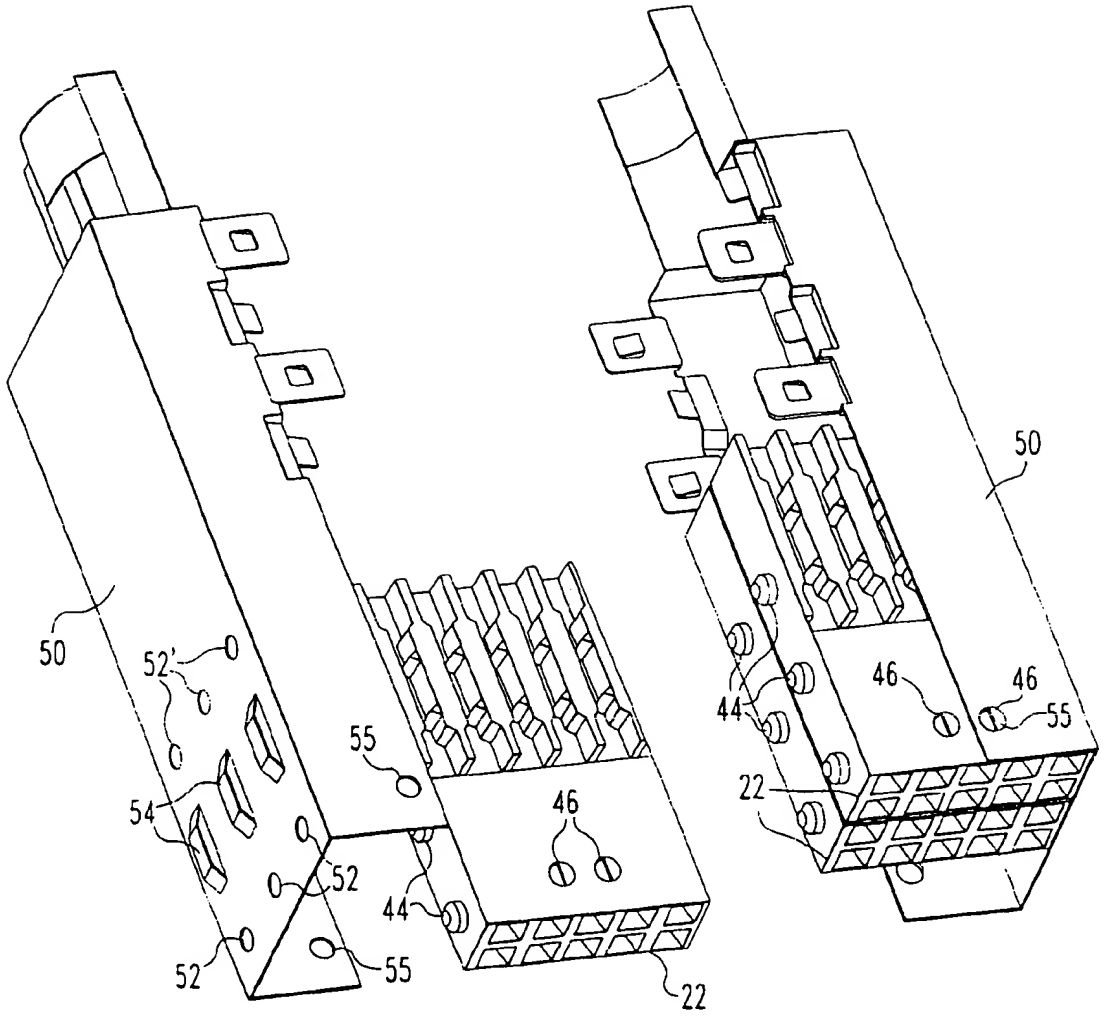


FIG. 9

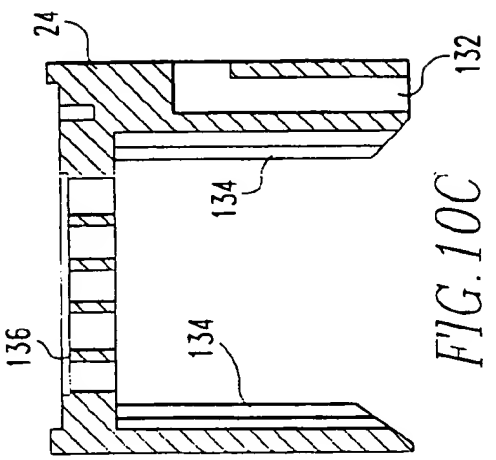


FIG. 10C

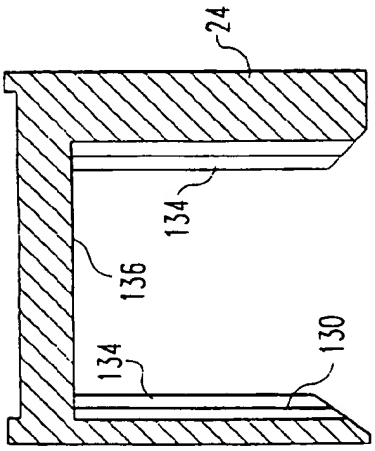


FIG. 10B

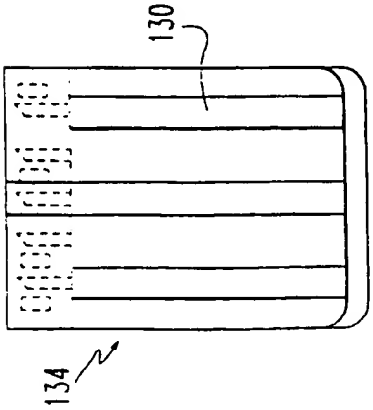


FIG. 10A

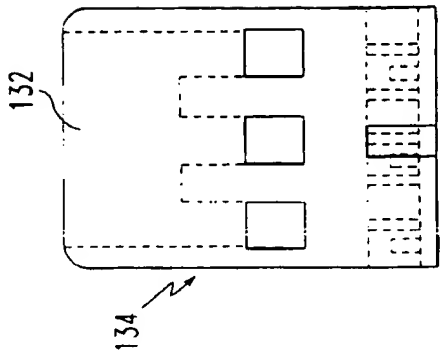


FIG. 10G

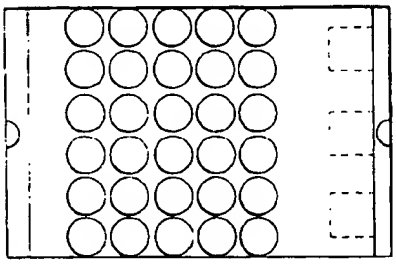


FIG. 10F

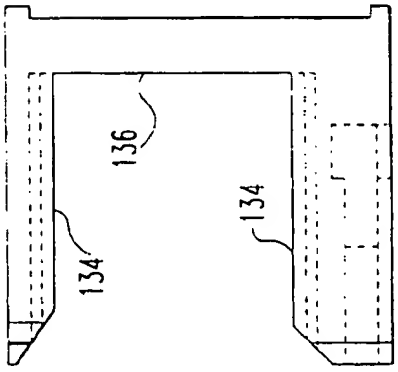


FIG. 10E

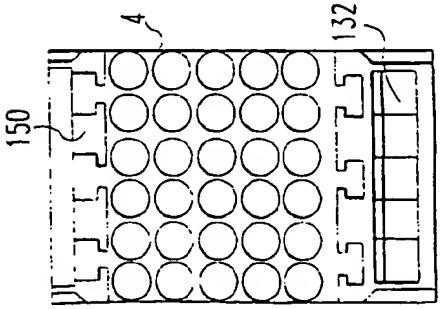


FIG. 10D

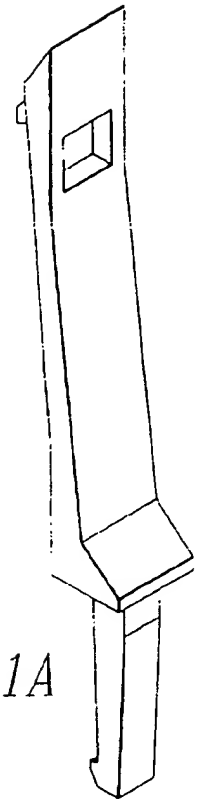


FIG. 11A

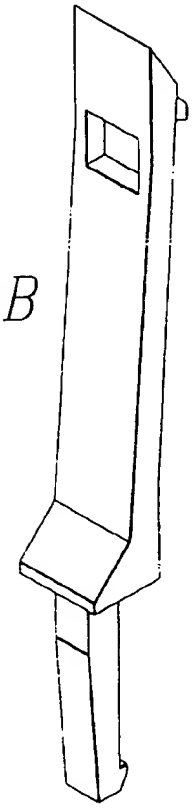


FIG. 11B

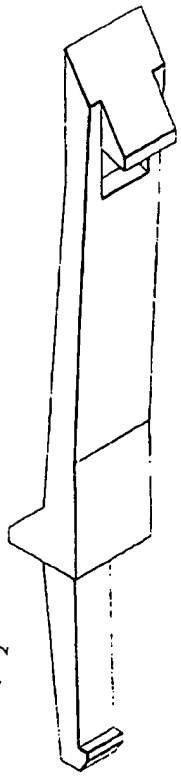


FIG. 11C

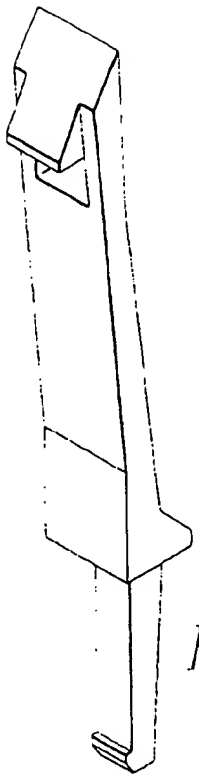


FIG. 11D

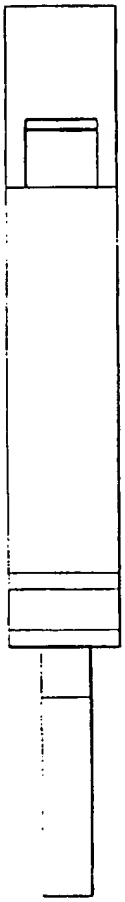


FIG. 11E

FIG. 11F

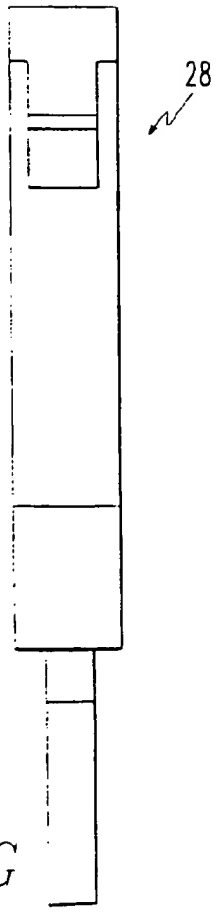


FIG. 11G

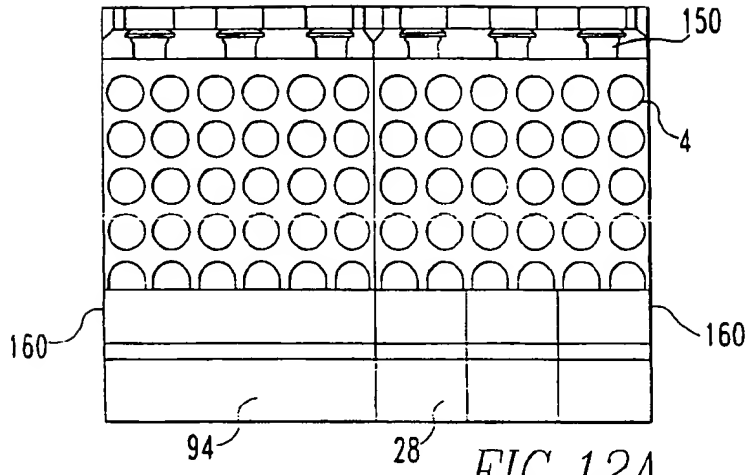


FIG. 12A

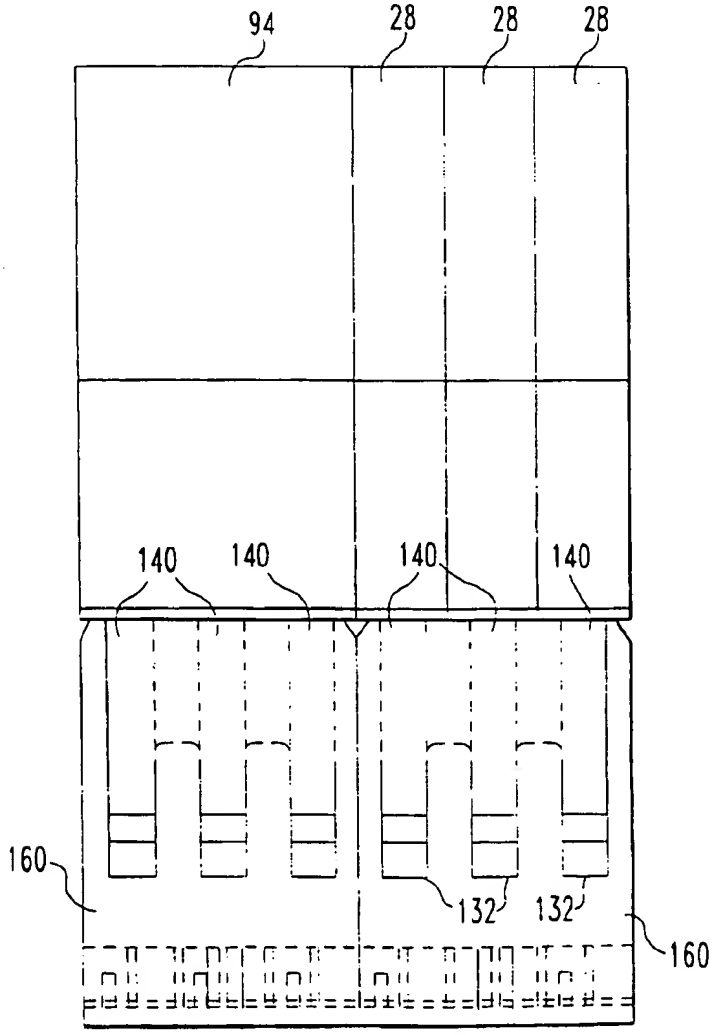


FIG. 12B

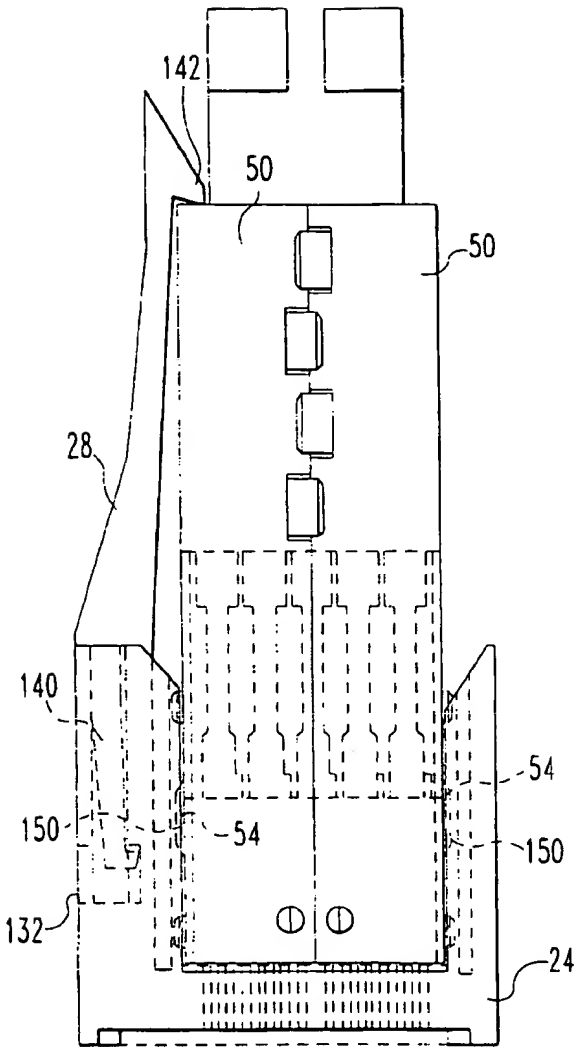


FIG. 12C

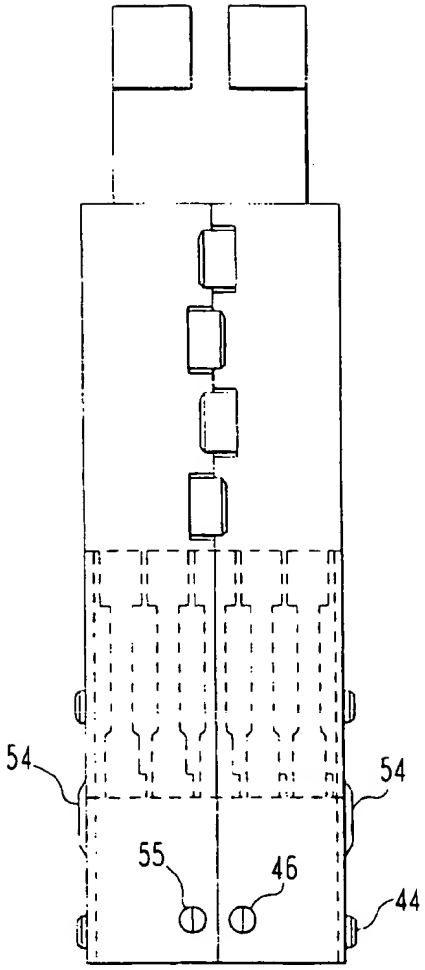


FIG. 12D

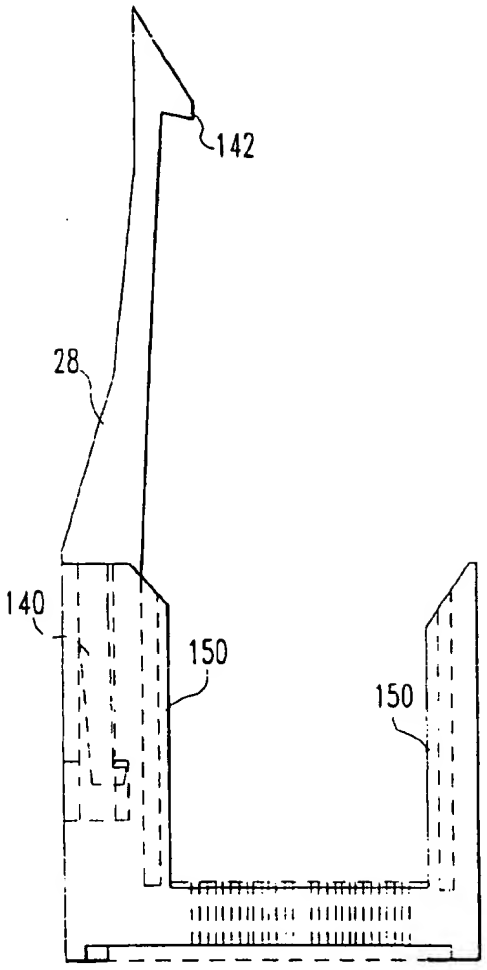


FIG. 13A

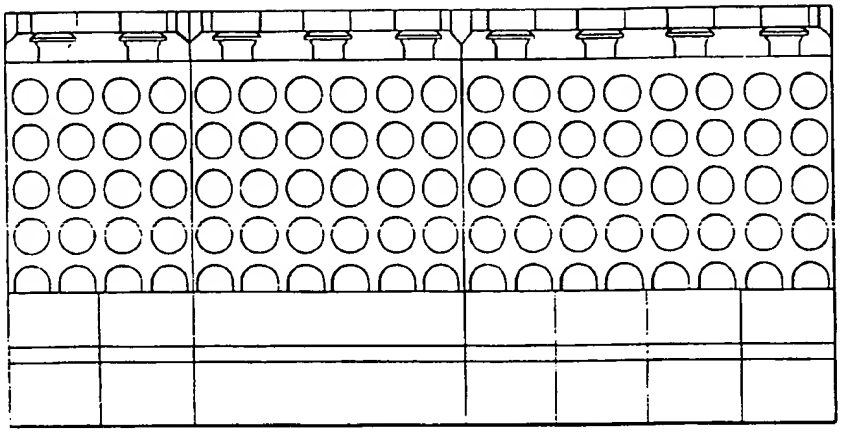


FIG. 13C

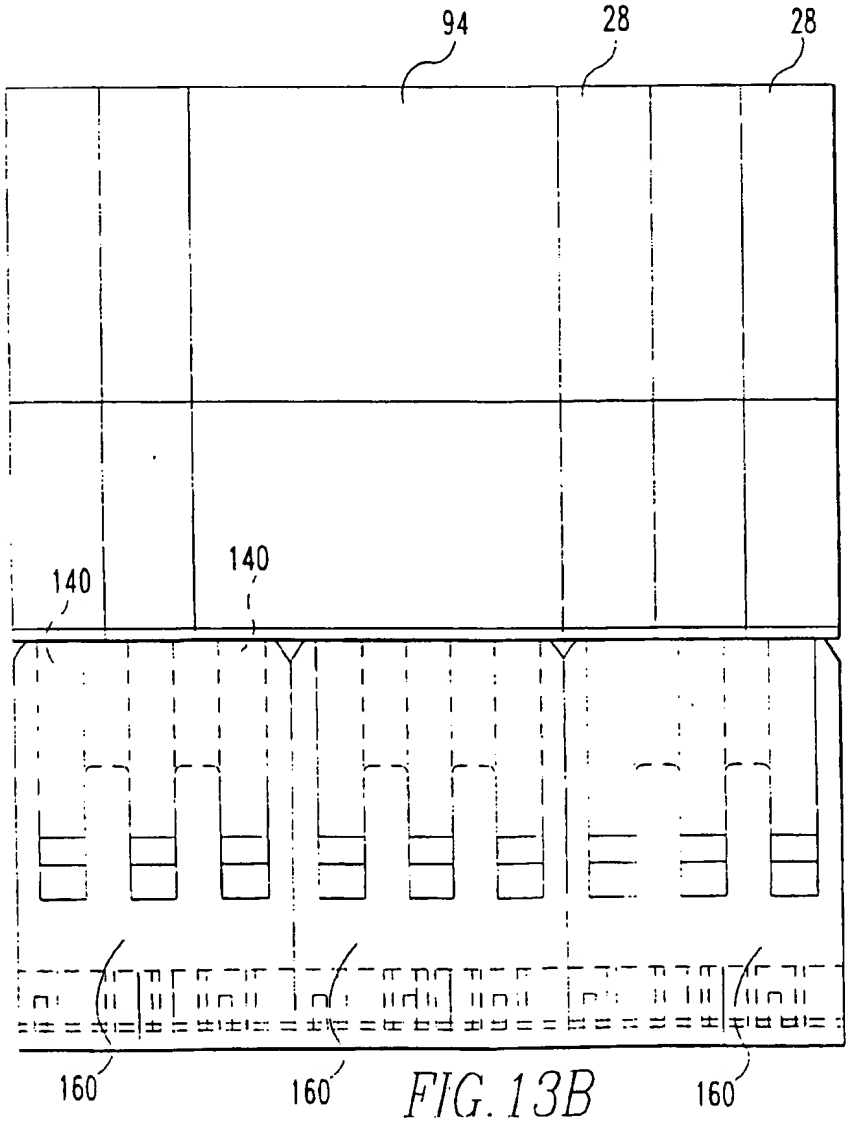


FIG. 13B

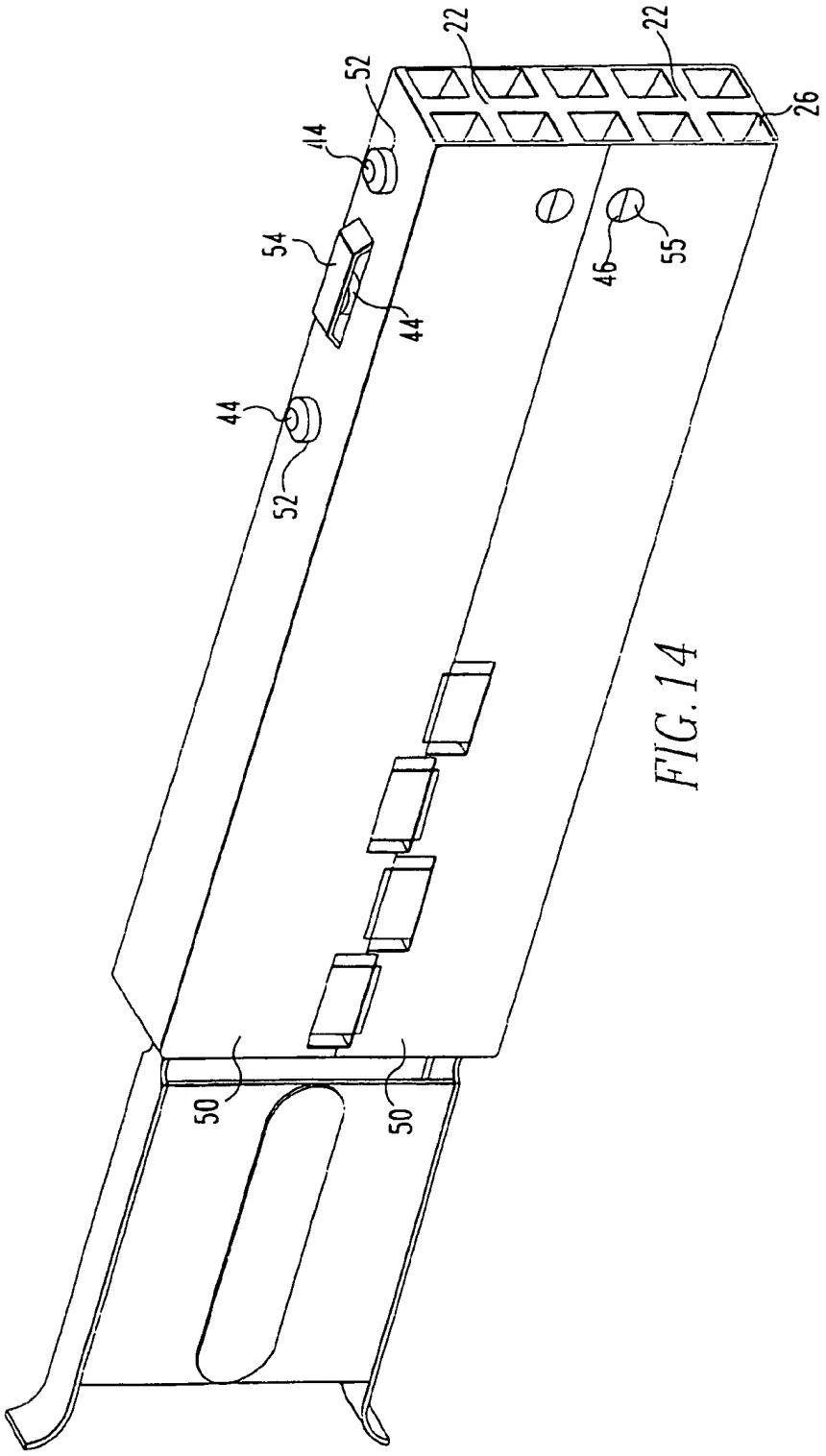


FIG. 14

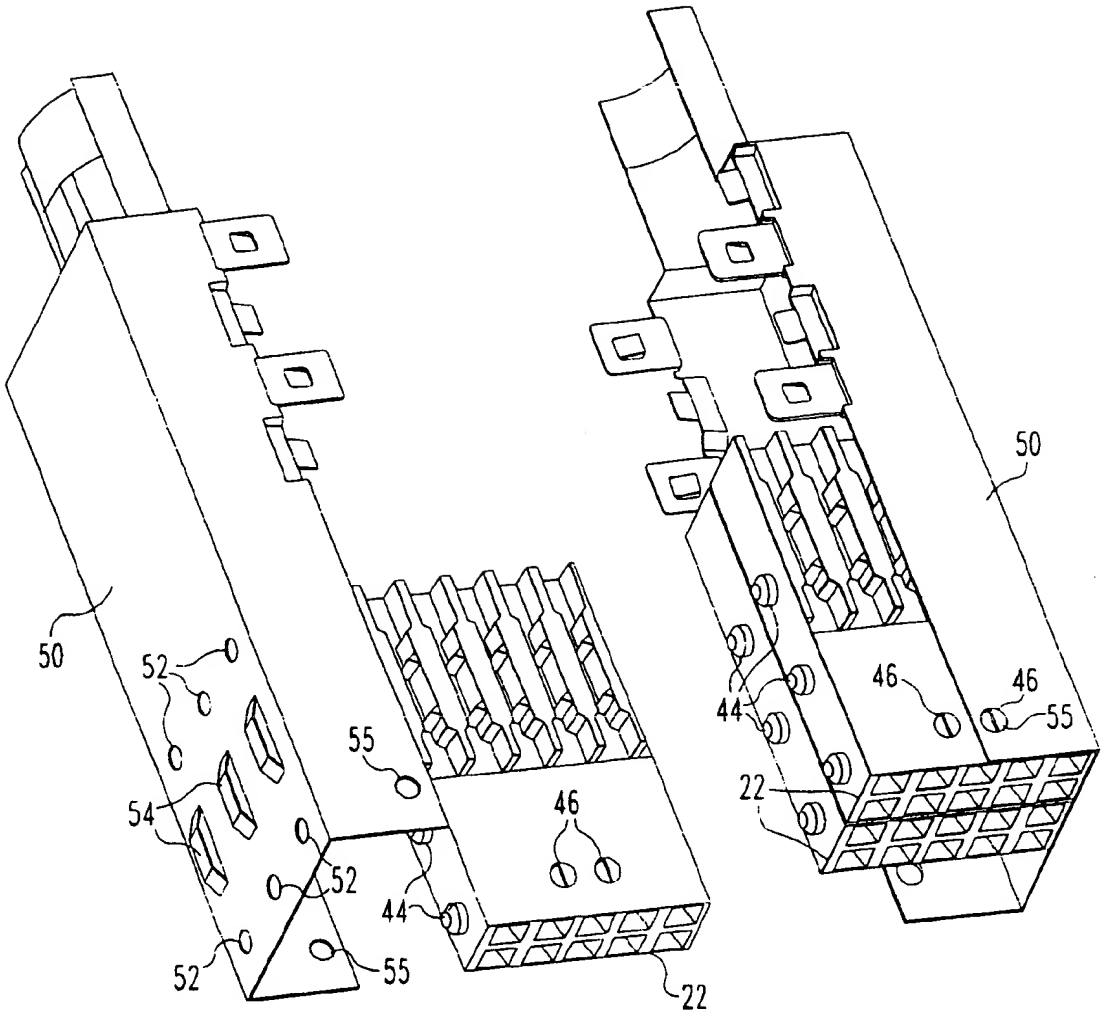


FIG. 15

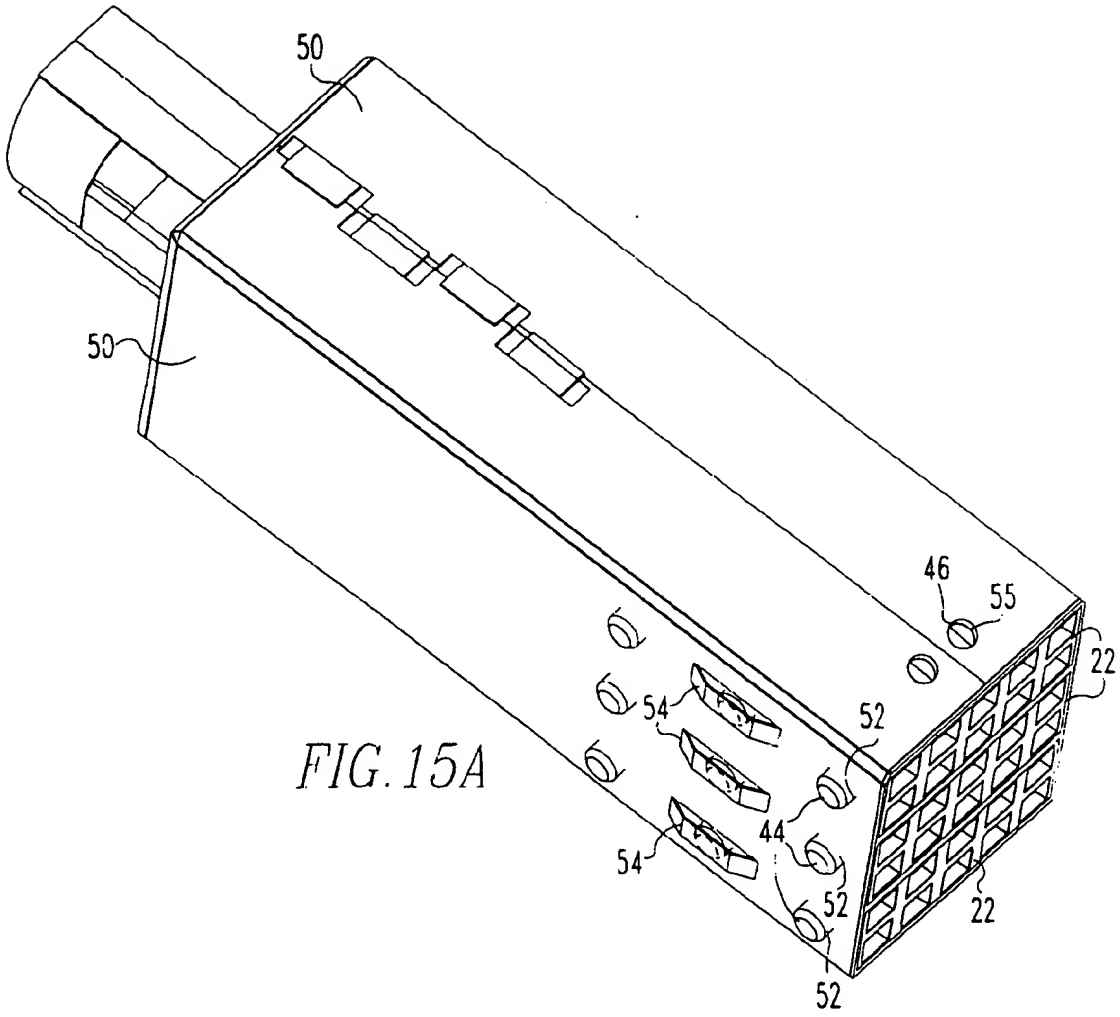
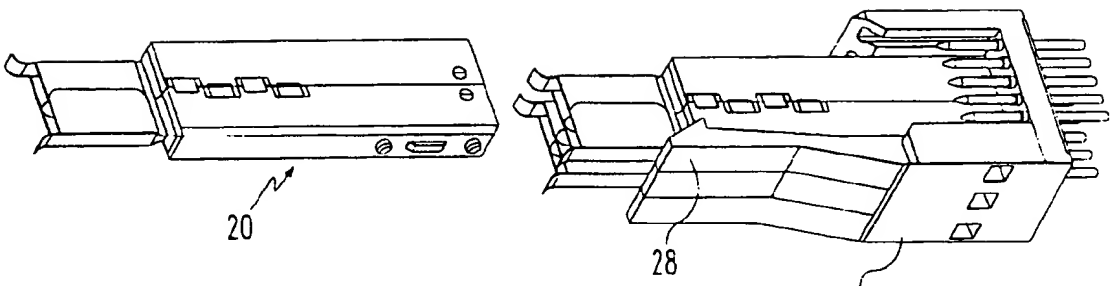


FIG. 15A



FIGF. 16

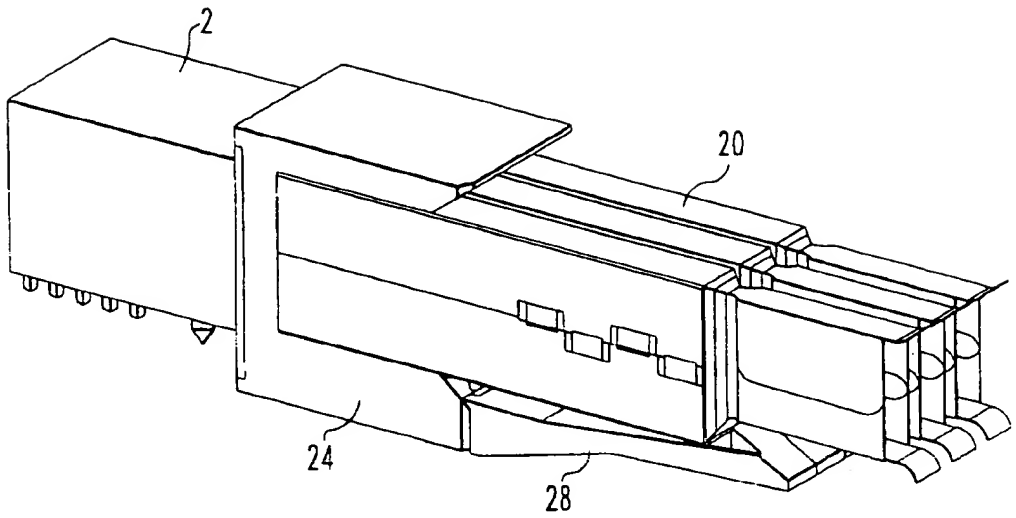


FIG. 17

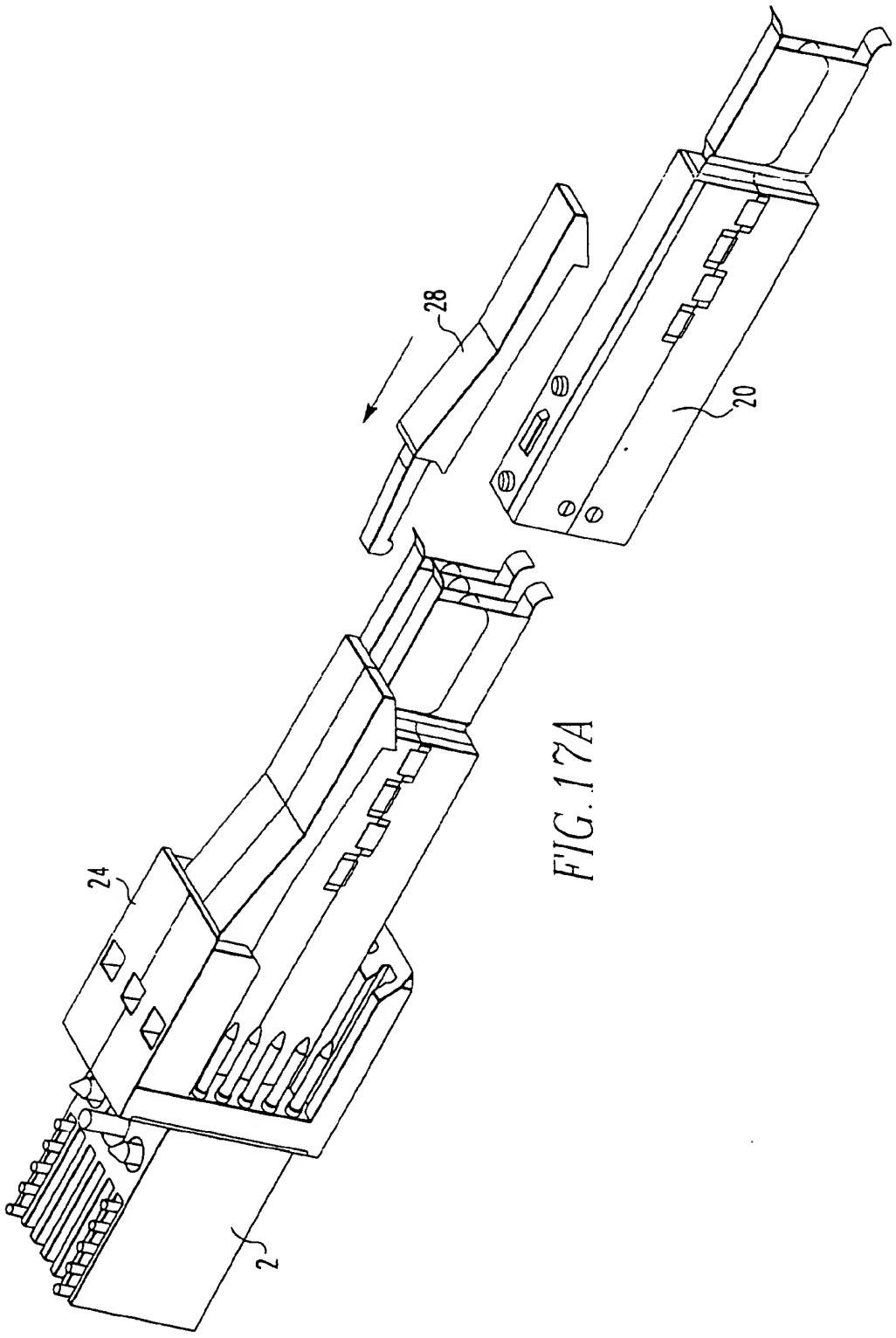


FIG. 17A

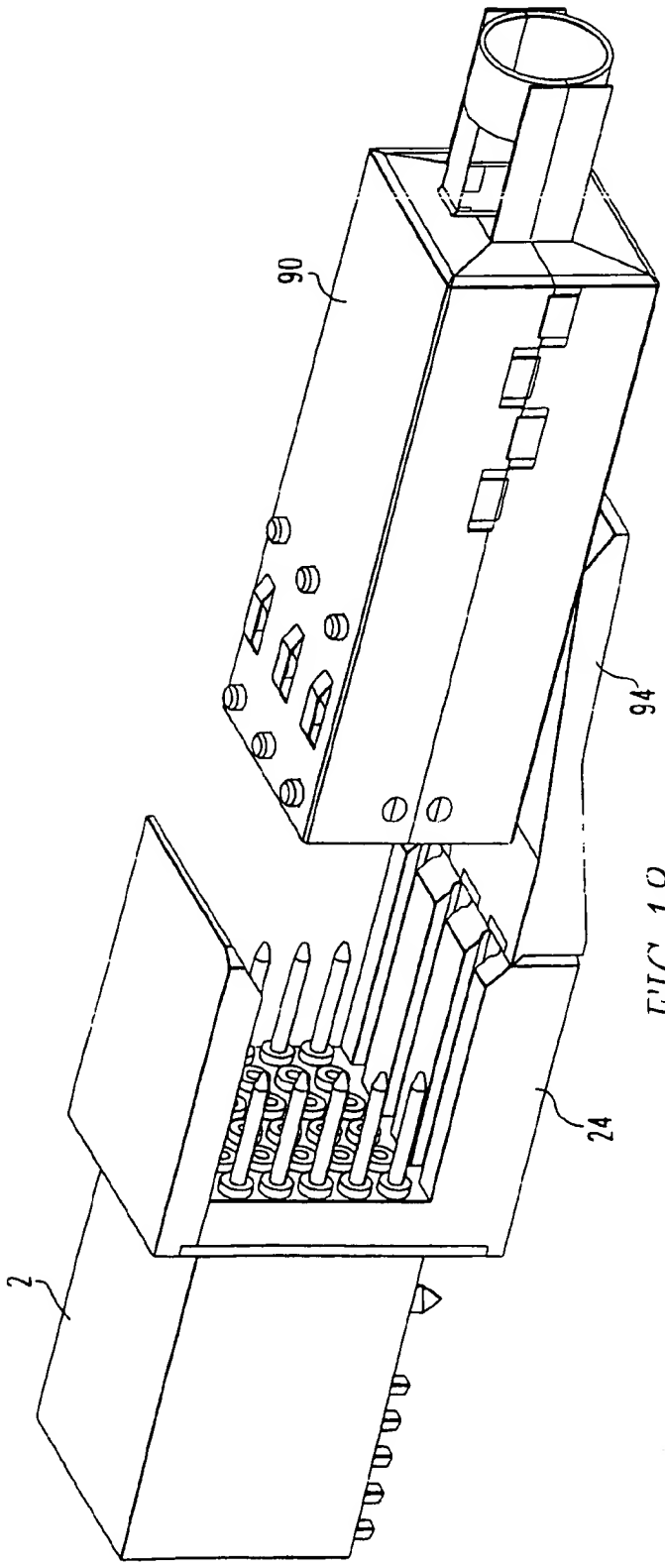


FIG. 18

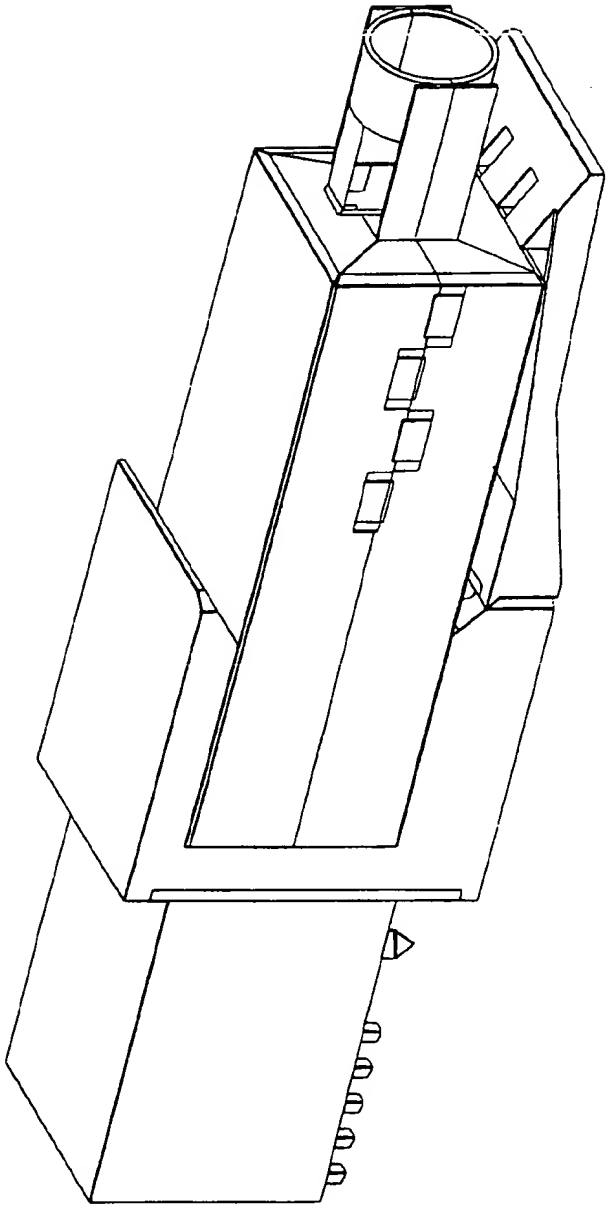


FIG. 19

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/10063

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :H01R 13/648
US CL : 439/610
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 439/610, 607, 608, 357, 358, 906

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,417,590 A (DECHELETTE et al.) 23 MAY 1995, SEE ENTIRE DOCUMENT	1-15, 18-25
X --- Y	US 5,456,618 A (NAKAMURA) 10 OCTOBER 1995, SEE ENTIRE DOCUMENT	1-15, 18-25 --- 16
X --- Y	US 4,824,383 A (LEMKE) 25 APRIL 1989, SEE ENTIRE DOCUMENT	1-15, 18-25 --- 17

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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